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Brachychiton megaphyllus, the Red-flowered Kurrajong

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Abstract

The Red-flowered Kurrajong *Brachychiton megaphyllus* is a large-leaved shrub of savanna and open forests of the north-west of the Northern Territory, Australia. It is deciduous during the tropical dry season and flowers and fruits whilst leafless. Excavation revealed a large, carrot-shaped tap-root which may enable the plant to maintain positive moisture balance whilst flowering by storing water. The Red-flowered Kurrajong raises intriguing questions about seasonality and life history in the monsoon tropics.

The Red-flowered Kurrajong *Brachychiton megaphyllus* Guymer (Malvaceae: Sterculioideae; formerly Sterculiaceae) is a common understorey shrub in open forests near Darwin. It is endemic to the Top End of the Northern Territory. Features of its biology include its few and exceptionally large leaves (Prior *et al.* 2003) that are shed late in the wet or early in the dry season (Williams *et al.* 1997; Prior *et al.* 2004), and its habit of flowering and fruiting while leafless (Figures 1–2). Near Darwin, leaves are shed in April and May (i.e. early in the dry season) and new ones appear mostly in October and November (i.e. usually after the first rains) (Prior *et al.* 2004); leaf lifespan averages 7.0 months (Prior *et al.* 2003).

Guymer (1988) described *B. megaphyllus*, separating it and several other species from *B. paradoxus*. Compared to *B. paradoxus* (BP) as he circumscribed it, *B. megaphyllus* is "readily distinguished" by: the sparse pubescence on the leaves and branchlets (BP has more and larger hairs); the larger slightly-leathery leaves (BP rarely exceeds 17 cm in length and width); and the (8-)10-30-flowered inflorescences (BP 2-10-flowered). The species occur parapatrically (adjacent with little or no overlap) across the Top End of the Northern Territory, with *B. megaphyllus* occupying the west and *B. paradoxus* the east and extending into Queensland. The dividing line lies approximately between Maningrida and Ramingining on the north coast of Arnhem Land, extending south-south-west to Barunga and Mataranka and thence south to Daly Waters (Figure 3). However, the species are often still confused

in the literature and the name *B. paradoxum* misapplied to both. For example, both Brock's (2001) description of Red-flowered Kurrajong and Wilson *et al.*'s (1990) description of vegetation types in the Northern Territory include both species under the name *B. paradoxum*.

The following morphological description draws heavily on that of Guymer (1988) but also incorporates our own observations. Around Darwin, *B. megaphyllus* is mostly a shrub to 3 m with one or more stems less than 5 cm diameter. However, in some areas such as the Victoria River District it can reach to 6 to 8 m in height and develop a trunk 10–25 cm diameter. It is sparingly branched with terminal branches that may be up to 1 cm diameter. Leaves mostly grow on terminal shoots. They are broadly ovate or almost circular and sometimes shallowly 3-lobed with a cordate (heart-shaped) base. Juvenile leaves in particular can be more than 30 cm in length by 25 cm in width. The brick-red flowers have a yellow or green base and appear in short-stalked clusters in former leaf-axils on old wood (Figure 1). They comprise a single perianth whorl, that is there are no distinct sepals and petals, the five

Figures 1–2. Red-flowered Kurrajong *Brachychiton megaphyllus*: **1.** flowers appear during the dry season when the plants are leafless; **2.** large woody fruits appear late in the dry season when the plants are leafless but may persist after new leaves are formed early in the wet season. (Don Franklin)

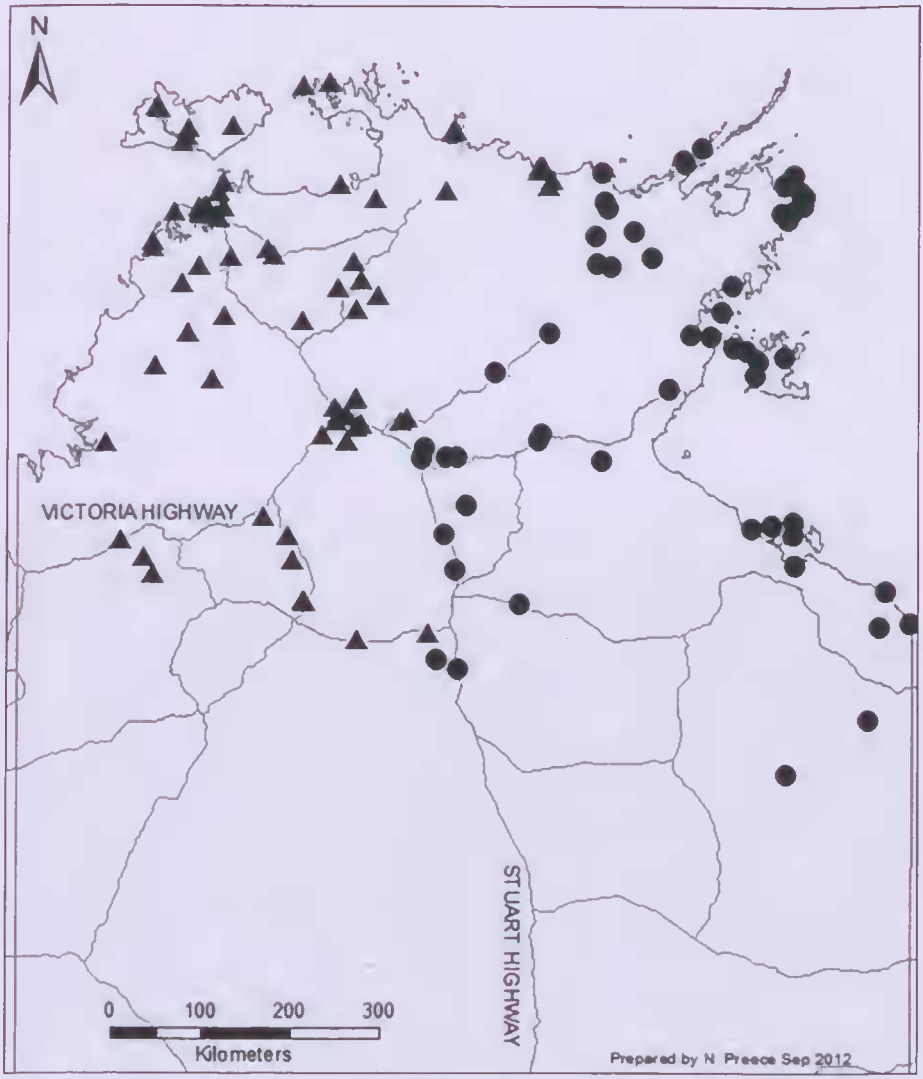


Figure 3. Distribution of *Brachychiton megaphyllus* (triangles) and of *B. paradoxus* (circles) in the Northern Territory as indicated by records from the Northern Territory Herbarium database. Grey lines represent highways.

(sometimes six) tepals being fused for 75–85% of their length to form an open, bell-shaped tube 2.5 to 5 cm diameter at the open end. Flowers are unisexual, but the sexes are similar in general appearance (Figures 4–5) and both sexes appear on the one plant (i.e. the plant is *monoecious*). The fruits are yellow-brown softly-hairy woody follicles to *c.* 10 cm long that split longitudinally and support 25 to 45 seeds each 8 to 9 mm long by 6 to 7 mm in diameter.

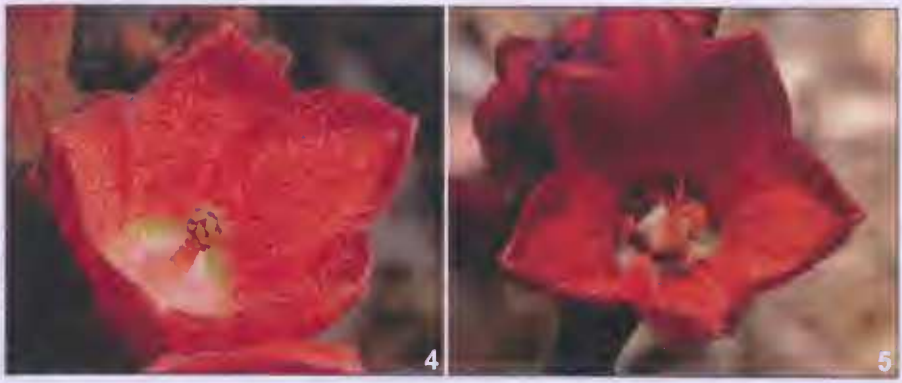
Whereas many deciduous plants of the seasonal tropics are shallow-rooted (Givnish 2002), an intriguing feature of *B. megaphyllus* is that it has a thickened, carrot-shaped tap root. Wiynjorrotj *et al.* (2005) illustrate a tap root that is c. 50 cm long and 5 cm in diameter. Our excavations show that the tap root can grow to at least 10 cm in diameter (Figure 6–7), and that there are remarkably few lateral or fine roots within 50 cm of the soil surface.

Brachychiton megaphyllus occurs in moderate to well-drained woodlands and open forests with a range of associated species and among both shrubby and predominantly grassy understoreys (Bowman & Wightman 1985; Wilson *et al.* 1990; Sharp & Bowman 2004; Brady & Noske 2010). It is often though far from invariably associated with either or both Darwin Woollybutt (*Eucalyptus miniata*) and Darwin Stringybark (*E. tetrodonta*). Though not known to fix nitrogen (Schulze *et al.* 1998), leaves have a high nitrogen content (Schmidt *et al.* 1998).

The open tubular shape of the flowers with a ring of nectaries at the inside base, along with their vivid red colour, suggests a generalised vertebrate-oriented pollination syndrome (Vickery 1992; Franklin & Noske 1999). A variety of honeyeaters, mostly smaller species, probe the flowers in evident nectarivory (Franklin & Noske 1999). Small native bees, probably *Trigona mellipes*, also visit the flowers, and they and the Brown Honeyeater *Lichmera indistincta* and Dusky Honeyeaters *Myzomela obscura* transport pollen (Alison Worsnop, pers. comm.).

Aboriginal people used *B. megaphyllus* for food and structural material and as a calendar plant (Smith *et al.* 1993; Marrfurra *et al.* 1995; Lindsay *et al.* 2001; Liddy *et al.* 2006; White *et al.* 2009). The seeds can be eaten after singeing to remove the irritant hairs, the roots can be eaten roasted or raw, and the gum is eaten raw. Bark of the species provides string and rope that can be used to tie food bundles and to make fish traps and nets. The gum can be mixed with ochre and applied to the skin for ceremonial purposes and the large leaves can be used to carry sugarbag (honey). The onset of flowering is a signal that Freshwater Crocodiles *Crocodylus johnstoni* are laying eggs.

The wide distribution and local abundance of *B. megaphyllus*, along with its tolerance of fire (Russell-Smith *et al.* 2003; Woinarski *et al.* 2004), mean that it is in no way a threatened species. Localised declines in the vicinity of Darwin seem likely to have followed clearing of Darwin Woollybutt/Darwin Stringybark open forests.



Figures 4–5. Flowers of the Red-flowered Kurrajong: **4.** Male; and **5.** Female. The five-branched stigma of the female flower is red but in some flowers it is white. (Don Franklin)

Figures 6–7. Excavated top of expanded carrot-shaped tap roots of the Red-flowered Kurrajong: **6.** A relatively young plant (Don Franklin); **7.** On what is assumed to be an old plant in which the above-ground parts have regenerated after fire (Will Duiker).

Brachychiton megaphyllus shows little or no ability to recolonise areas mined for sand or gravel (Price *et al.* 2005).

The annual cycle of *B. megaphyllus* poses intriguing questions with implications for the life histories of a range of plants in the monsoonal tropics. Leaf shed no later than early in the dry season suggests pre-emptive avoidance of desiccation rather than a response to it. Desiccated plants cannot flower and fruit; the fleshy tap root may well be used to store sufficient moisture to enable reproduction during the dry season. Janzen (1967) proposed that many plants flower during the tropical dry season to maximise resources for vegetative expansion during the wet season, as well as to optimise pollination. An alternative, or additional, explanation for the timing of flowering may be to minimise seed predation and maximise time available for seedling establishment before the next dry season, by producing seed late in the dry season. This explanation is contingent on the seed lacking strong dormancy and thus being able to germinate early in the wet season, which seems likely as in cultivation it germinates readily at any time (Yvette Brady, Greening Australia, pers. comm.). It may be no coincidence that the flowers of *B. megaphyllus* are red, a recognised colour signal for birds (Vickery 1992). Further, flowering whilst leafless may render the flowers more visible to potential pollinators (Janzen 1967). A number of plants in monsoonal Australia that flower in the dry season, when insects and fruit are often in short supply, attract a range of birds (not restricted to honeyeaters and lorikeets) as potential pollinators (Franklin 1999) and have red or orange flowers. Examples include Darwin Woollybutt, Scarlet Gum *Eucalyptus phoenicea*, Fern-leaved Grevillea *Grevillea pteridifolia* and a number of other grevilleas, and the Kapok Tree *Bombax ceiba* which also flowers whilst leafless. It would be interesting to know whether the very large but short-lived leaves of *B. megaphyllus* provide a high benefit:cost ratio to the plant per unit time. Leaves have low leaf mass per unit area (Prior *et al.* 2003), indeed suggesting that they are produced at low cost per unit area of photosynthetic capacity.

Acknowledgements

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